

Descriptions of some New Trap-Door Spiders; Their Notes and Food habits.

By GEO. F. ATKINSON.

A few months after sending the manuscript of the article, "A new trap-door¹ spider", to the publishers, I found a specimen which differed so markedly in color from the one, the subject of that article, and agreed so closely with the one described by Hentz as *Mygale carolinensis*,² now *Pachylomerus carlinensis*,³ Hentz, that before having an opportunity to study them carefully I concluded the only difference was in color. Just after the article, "A family of young trap-door spiders",⁴ was in type I discovered that the two forms were different species: that the one called in the Amer. Nat. "A new trap-door spider", and the young spiders whose work is described in the Ento. Am. were both new species: the former I have called *Pachylomerus caribvorus*, and the latter *Pachylomerus 4-spinosus*.

The nests of *P. caribvorus*, and *P. 4-spinosus*, have already been described in the articles referred to. One thing however, in regard to *P. caribvorus* is worth adding. The last trap-door made by this species as described in the Am. Nat. p. 590, was in sharp contrast, being made almost entirely of clay, with the surrounding moss. In a few days the spider made an examination of its work and found it had made a mistake in not placing moss in the door. It remedied this as well as possible by cementing moss to the edge of the door and pressing the ends down so that about half of the door was covered with moss!

Nest of Pachylomerus turris. March, 5, '86, on turning over an old log, a sudden movement of an object downward attracted my attention, I looked and discovered a silken tube, with particles of earth and leaf mould attached extending above ground. On one side the silk was so extremely thin as to afford a "window" to the spider's house! It was through this that I had discovered the movement which attracted my attention. Nearly the entire remaining portion of the tube was covered with earth and leaf-mould, and here the silk was thinner than in other portions, yet intact. It seems almost incredible, yet from the wonderful intelligence manifested by these spiders, I was led to think this "window" had been purposely made: that the spider would sit by it and watch for beetles crawling about under the log, and seeing one would rush out

¹ American Naturalist, Vol. XX, p. 583, July 1886.

² The Spiders of the United States, by Nicholas Marcellus Hentz, M. D., Boston Journal, IV, p. 56. pl. VII, fig. 3.

³ Beiträge zur Kenntniss der Territelariac, Ausserer, p. 147.

⁴ Entomologica Americana, August 1886.

through the door, seize its prey and return to its tower! It seems more reasonable when we consider that *Nidivalvata marxii* (see food habits of this species,) will nightly open its doors, remain out of sight, watch for passing insects, and rush out and seize them. The tube was about 8cm. in length, and there was only a very shallow excavation in the clay soil. The door is of the "wafer type", and was fastened down by silk, probably in the fall when the spider prepared for hibernating.¹

In the evening I placed the spider in a bottle of earth. During the night it burrowed into the soil and made a rude door, which appeared more like a flap hung from one side of the mouth of the tube. On the evening of Mar. 7, I removed a portion of the soil and placed in a portion of clay intermixed with loam, scattering over this a few bits of moss. I did not see the spider make the burrow, but next day saw it make two-thirds of a door, when I put an end to operations on that nest. The door was made practically in the same manner as that by *P. caribivorus*, but was a wafer door.

From the appearance of the tube and the soil about it in both of the nests made in captivity, I felt sure this spider did not dig the hole in the *normal way*. Accordingly, Mar. 8, I prepared a jar of wet clay. Up to 11, p. m. the spider had not begun work, but in the morning the work had not progressed too far for me to observe it. The spider begins the burrow in a manner similar to that practiced by *Nidivalvata Marxii* by pressing the earth aside from a central point with its anterior legs, using also its mandibles, but it is much slower in its movements than

¹ Mr. Moggridge says in *Harvest Ants and Trap-door Spiders*, Supplement, p. 236. "I have on very few occasions, found the doors of a wafer or cork nest spun up during the winter at Mentone, and on digging have discovered the spider alive, though partially torpid, inside; but this I think is quite an exceptional event. I should like to know, however, whether this becomes the rule in the case of the nests of those trap-door spiders which inhabit climates less favored than that of Mentone." He also speaks of a *Lycosa* that is said to close her nest in Canes in winter. Latreille, in *Mem. Soc. Hist. Nat. Paris*, (an VII, de la Republique) p. 124, Says, "L'araignée tarentule ferme aussi son habitation, mais cet opercule n'est pas mobile, et n'est construit que pour l'hiver." I have on several occasions found that *P. caribivorus*, after eating one or two beetles, fastens down the lid with silk. *Nidivalvata marxii*. I have found fastens the doors at times (See *Amer. Nat.* Vol. XX, p. 592.)

O. P. Cambridge, in *Annals of Nat. Hist.* 1878, 5th series, Vol. I, p. 107, says that in all cases that came under his notice the upper extremity of the nest of *Atypus piceus* was without any perceptible orifice. He finally came to the conclusion that the spider gnawed its way out and then closed it with fresh threads again. These examples seem to indicate that spiders will very frequently at least fasten the doors to their nests during a period of rest, when inactive and more liable to be injured, when having had sufficient food, and perhaps sometimes at regular periods when not engaged in watching for food. It seems reasonable to suppose that in climates where the spiders are in a torpid state they would fasten their doors during this period.

N. marxii. *Pachylomerus turris* is the spider represented in fig 15 & 16 of the Ento. Am. for Aug. excavating in a "novel way". In making the trap door, sometimes when in this position it would cement the particle to the door by pressing on top of the door with its posterior legs, against the ventral surface of the cephalothorax. When the hole was about 3cm. deep it would occasionally take earth out in the normal way.

It will be seen that the habit of this spider is not wholly nocturnal in building its nest. During the month of July while I was at Ithaca, N. Y. I had a specimen of *P. caribivorus* make a nest for Prof. Comstock. This was made entirely during the day. By reference to the young trap-door spiders¹ it will be seen that *P. 4-spinosus* works just about as well in day as at night.

Nest of Nidivalvata marxii. The first one of this species which I found was taken Jan. 2, 1886, and which I have formerly mentioned as making in captivity a "folding door."² In tearing up some moss I observed a tube in the bottom of which was the spider. Whatever there was at the upper end of the tube was destroyed in removing the moss, so that I have not had an opportunity to observe the door to the nest where the spider makes its nest in a patch of moss. I have found several nests of this species by gathering moss. In all there were what appeared to be branches just above the surface of the ground at the base of the moss. These I regard as avenues in which the spider would search, or lie in wait, for ants.

In captivity this spider made a very interesting nest with folding doors (See figs. 17 and 18 Plate V) and I believe it is with some such arrangement that it closes its tube in a state of nature, for the spider makes use of it in catching its prey, as will be described in the food-habits of this species. This kind of a door, I believe, has never before been seen or described, and adds one to the different types of nests which Mr. Moggridge has described and named.³ The right name for this type should be "double door", but as Mr. Moggridge has used that name for a nest which has two doors, one at the upper end of the tube and another some distance below at the opening of a branch in the main tube, it cannot be applied to this one. So I have called this new type the *folding door nest*, from the manner in which the door opens and shuts.

This species begins the excavation of its tube by parting the earth from a central point with its anterior legs and palpi turning around at the same time so as to push the earth on all sides. It works with ex-

¹ Entomologica Americana, August 1886.

² American Naturalist, Vol. XX, p. 592.

³ Harvesting Ants and Trap door Spiders; and Supplement.

ceeding rapidity, and in this respect is in strong contrast with the members of the genus *Pachylomerus*, though the young ones of that genus work more rapidly than the older ones. When beginning the nest in a patch of moss the spider will dive down into the moss and begin turning rapidly in all directions, at the same time spinning threads to fasten together the pieces of moss around and over it. I have watched four different ones make the nest, two beginning in moss which I had placed over the earth, and two beginning in soil. Two of these I had make a nest several times, and thus far every one has first entirely closed the entrance to the tube by building a sort of dome above it. Later, in one case a week, cutting through this and making the folding door.¹ Usually while at work near the surface of the earth it will burrow out in different directions and elevate the surface of the earth. This I think is partly for the purpose of providing a place to put the earth which it excavates from the lower portion of the tube, as I have seen these filled up; and in one specimen, after the tube was about 2 cm. deep I observed the same habit of digging and cementing to the edge of the tube, as observed in the case of *Pachylomerus caribivorus* and *A-spinosus*. This individual made the dome by carrying up three sides regularly until it had completely covered the entrance. Usually in making the dome earth is placed on and about the edge of the tube, occasionally applying viscid liquid and spinning threads over it. Then the spider would, with its anterior legs and palpi pull the edge over the tube. This operation would be repeated until the dome was complete.² When moss is convenient the door is made almost entirely of moss and silk; each door is a surface of a half circle, is hung by a semicircular hinge, and the two meet, when

¹ NOTE.—In the *Encyclopedia Britannica*, 9th edition, 1875, Vol. II, p. 291. O. P. Cambridge says: "The present writer was once told by a gentleman who had formerly resided in the West Indies that trap-door spiders invariably made the tube and lid of one continuous, solid, homogeneous piece, and then cut out the lid with the falcers. This account, especially as coming from a non-Naturalist seems improbable, a spiders falcers being in no way fitted apparently for such an operation." Where the silk lining was thin, it would be a very easy matter for a spider to cut through, and then repair the roughness by cementing on particles. It is probably an exaggeration to say that they "invariably" construct them in that manner, but I should not be surprised if some species made the trap-door in the manner described by this non "naturalist."

² I have never seen this spider press the lid on the ends of its mandibles as does *P. caribivorus*. I think this shows the adaptation of the special armature of the mandible of *P. caribivorus*, and related forms, for fastening the earth to the lid. *P. caribivorus* usually makes no thread in applying the viscid liquid to the door while adding particles, but puts it on as a cement. The large point of the mandibles, which is covered with short strong spines serves admirably to punch the earth irregularly into the portion of the door already made, and causing it to adhere firmly.

closed, in a straight line over the middle of the hole, as shown in fig. 18, Plate V. Every night (I observed one in my room for three months) the spider would throw open its doors as shown in fig 17, Plate V and in the morning close them. If I opened the door during the daytime the spider would invariably come up and close it, but never immediately, and never did it offer to catch the door and resist its opening. When members of this genus build their nest under stones, as they sometimes do, if the stone is elevated from the earth in one place the spider builds the tube above ground to the under surface of the stone, and here makes some sort of door, I have never been able to see just what, but probably very much like the ones made in captivity. A longitudinal section of one of these nests which I found under a stone is shown in fig. 11, Plate, IV, the surface of the ground at *a* and the mouth of the tube at *b*. On turning over the stone I saw what I thought was the cocoon of a moth, from which the insect had escaped at the upper end. I picked it up, and discovered the tube which I found about 12 inches deep, with the spider¹ at the bottom. This nest, perhaps inappropriately, I have called the *hall door nest*, because of the enlargement just within the entrance. This I consider would be of advantage to the spider in managing the door while catching an ant. The portion above ground was made of loam and leaf mould cemented with viscid liquid and lined on the inside with silk. So far as I have observed, the members of this genus line only that portion of the nest with silk which is liable to cave in near the upper portion of the tube.²

Nest of Myrmekiophila foliata.

The nest of this species is not constant in type, and shows wider variation in different individuals than any of those thus far described; but when taken in connection with the food habit of the species there does not seem to be a very great departure from a common type.

The first individual was collected March 13, '86 by myself. In collecting specimens of ants and their root feeding "cows" (Aphides) which they were protecting through the winter, I found a trap-door on turning over a stone. The tube I traced down about 14 inches, when I came upon and struck the spider off at one side. In doing so I broke off a leg and palpus so that the spider died the next day. At the time I thought the spider must have underground galleries in which it hunted for ants similar to the galleries in the moss of the nest of *Nidivalvata marxii*. But since finding the nests of other individuals I think there

¹ *Nidivalvata angustata*.

² I have observed the same thing with *Myrmekiophila foliata*.

must have been a branch from the main tube with a trap door, and the soil being so full of rocks I failed to find it.

The second individual I collected on the morning of Apr. 6, '86, while digging into a side hill with a southern exposure for white ants (*Termes flavipes*,). Discovering a tube I traced it until I found at one side a trap door opening into a short branch. In this I found a fine specimen of trap-door spider. The nest I concluded belonged to the type called by Mr Moggridge, "Double door branched nest", but differs from that in having a cork door instead of a wafer door. I did not see the door at the end of the main tube, if there was one, as the soil was very loose and rocky, and every trace would have been destroyed before finding the main tube.

The third individual was collected in the afternoon of the same day, by one of the students, D. E. Woodley. The tube ran under a stone, a trap-door was at the upper end, but the branch and second door was not seen: Mr Woodley said, however, that it might have escaped his notice as the tube was not traced out very clearly.

The fourth individual I collected Apr. 6. On turning over a stone I saw what is represented in fig. 16, Plate V except that the trap door was closed, and the spider was in the tube a short distance below it. The space above the trap door is a portion of an ants nest, *b* is the entrance from the surface of the earth; *a, a*, is a broad hall-way leading off into galleries on the side. The spider had come down at *b*, undoubtedly during the night while the ants were quiet, unconscious of the purpose of their terrible enemy, dug the hole in the center of this hall way, and covered it with a trap-door before the ants were stirring at the break of day. The soil was in a good condition for tracing out the tube, which I did very carefully and found neither branch nor second door, so that this nest was of the type *single cork door, unbranched nest*.

The fifth I collected on the same day and not more than 10 feet distant. Turning over a stone I saw a tube which ran down one of the perpendicular sides of the hole, in which the rock fitted, then along the bottom to near the center of where the stone lay. Here it disappeared taking a perpendicular direction again. I ran a straw down this tube and felt the movements of the spider. The spider would not seize the straw, as they sometimes will, and soon I could no longer feel the movements. I then dug carefully around the tube, and at the depth of about 10 inches struck the spider, splitting open its caput. This happened because the spider was in the branch: when I first ran the straw into the tube he was in the main tube, and probably being frightened ran into the branch and caught hold of the door. This confirms what Mr. Mogg-

ridge believes to be the case with spiders making a double door branched nest, that when an enemy succeeds in getting entrance to the main tube the spider will run into the branch.¹ This nest is represented in fig. 15, Plate V. Though the tube is represented nearly natural size the length is much fore-shortened. The space represented by the dotted lines *a* and *b* was 10 inches for each. The spider was found at *b*; the cork door can be seen at *c*.

Another specimen was found, about which, unfortunately, I have no record nor recollection, except that it was collected sometime during the spring. This, though I have not given it a careful examination I believe to belong to the same species. I left it in the possession of Dr. Geo. Marx, at Washington.

The specimen collected Apr. 6, I placed in a jar of earth to see what kind of a nest it made in captivity. For several days it showed no signs of working. Finally I found it buried in the earth much as *Nidivolvata marxii* is, when having just completed the dome over the tube, and from the appearance of things I think the burrow was started, and the dome made in the same way as in the case of that species. The next day in place of the dome, in which there was no moss, was a perfect cork door with an abundance of moss in it. The spider had evidently cleared away the dome, which was made of earth and silk, and made the door of new material.

When I lifted up this door the spider would catch hold of it. In a few days I found this door fastened down and that end of the tube filled with earth for a distance of 5 cm. The tube extended in a circuitous direction for 10 cm or more where it came to the surface and was closed by another nicely fitting trap-door. I think the spider was alarmed at the discovery of her nest, and attempted by this strategy to deceive her enemy. If the jar of earth had been more capacious, and a longer time given the spider she might have made a branch and second door.

* *Food habits.* I have not yet had an opportunity of making very extensive observations on the food habits of these species, and cannot say that each one is confined to the insect for which I am certain it has a special fondness as an article of diet. Of the species of *Pachylomerus* my observations have been confined to *P. caribivorus*. I have already stated the fondness which this species has for carabid beetles,² and though killing several ants and flies did not use them for food. During July, while at Ithaca N. Y. I fed several carabid beetles to a *P. caribivorus* which I

¹ Harvesting Ants and Trap-Door Spiders.

² Am. Nat. July 1886. Vol. 20, p. 592.

had alive. June 20, I placed a *Pterostichus lucublandus*¹, Say, in the bottle containing the nest of the spider. During the night the spider came out of the nest, caught the beetle, ate it and ejected the hard parts from the nest. July 1st, it disposed of a *Pterostichus Sayi*, Brulle. June 29 it ate a beetle of the genus *Chlænius*. At another time it ate three good sized beetles of the genus *Chlænius* in one night.

The observation which I made on *Nidivalvata marxii* in captivity are very interesting. I noticed that at night the spider would throw its doors wide open² as shown in fig. 17, Plate V. One evening I placed several in the jar containing the nest. When an ant approached so near the door as to send a communication to the spider of its presence, the spider sprang to the entrance, caught a door with the anterior legs on either side, and pulled them nearly together, so that there was just space enough left for it to see the ant when it crossed the opening. When this happened, the spider threw the doors wide open, caught the ant, and in the twinkling of an eye had dropped back to the bottom of the tube with its game. This I saw repeated several times during the months of January and February. At one time I placed a large cricket in the jar. The spider made several attempts to capture it but was not strong enough. It would probably eat crickets when fortunate enough to catch one. I think also that it would eat small carabid beetles, for I found several in the moss where I collected the spider. I have found the remains of ants in the nests.

I have made no observations on *Myrmekiaphila foliata* in captivity, but from the location of their nests it is quite evident that the members of this species are extremely fond of ants, and seek to build their nests

¹ I am indebted to Prof. J. A. Comstock for the identification of the species of beetles.

² The position of *Nidivalvata* in the subfamily *Eriodontinae* shows its near relation to the *Atypinae*. I have often been struck with its likeness to the *Atypinae*, especially in the kind of a nest it makes, and though I have never seen an *Atypus*, nor one of its nests, I have often concluded that from the form of its nest it must be somewhat similar to *Nidivalvata* in architectural habit, and that the presence of a door, or covering for the entrance to its nest instead of being wanting, has been overlooked; that in the cases where the nest was open, accident had removed the door. What O. P. Cambridge says in *Annals of Nat. Hist.* 4th series, 1875, Vol. XVI, p. 240-241, seems to me to indicate that *Atypus* is very similar in habit to this genus. Not only in the form of the nest, but in its food habit. He says that on one occasion a nest which apparently had no orifice was buried in a box of earth; subsequently the tube was observed with a wide open mouth, and again was closed the following morning. The spider probably opens the doors at night to watch for food, and closes them in the morning as does *N. marxii*.

either directly in an ants nest or in close proximity to it. I think in some cases it is intended that the main tube shall be used as a passage for ants, so that by coming out of the branch the spider can capture its food, for it is certain in these which I have observed that the external door is either wanting or old and in a neglected condition, while the door at the branch is kept well repaired. If I am correct in this conclusion it would account for the apparent variation noticed in the kind of nest built by this species. In the nest represented in fig. 16, Plate V, the entrance *b*, and the landing *a, a*, of the ants nest answers for the main tube of the spider, and only the one tube and trap-door is required for the use of the spider.¹

¹ NOTE.—There evidently is quite a variation, even with the same species, in the kind of a nest which trap-door spiders make. As these prove to be very intelligent creatures, I believe they vary in the construction of the nest as the conditions of their environment varies, and that they adopt that plan which provides for them the safest abode, and at the same time will serve them the best as a trap. At the same time we must not lose sight of a common type, which, with some useful variations, each species follows; though species of different genera may make the same kind of a nest, and be identical in food habit, species of the same genus may vary with regard to the common type; so that the use of nests, and food habits, becomes of less value than has been heretofore supposed by some for purposes of classification.

Mr. Moggridge says, "H. A. and T. D. Spiders" Supplement, pp. 236, and 237, the range and distribution of a species largely depend upon the nature of its food, and this will also be an indication of the rivals etc. — "and in many cases even the structure and position of its dwelling place will be governed by this same all-important question of food supply."

Rev. O. P. Cambridge, at that time came to this conclusion, "and in the present case it is very important, as well as interesting, to conclude with some certainty that differences of type in the tubular nests of the spiders Mr. Moggridge has observed so closely and accurately, are joined to well marked specific differences etc. "Harvesting Ants and Trap-Door Spiders, Supplement, p. 301". Later, Cambridge doubts such close union of specific character and architectural habit, for he finds nests of *Alypus piceus* varying greatly in construction. (Annals of Nat. Hist. 1878, 5th series, Vol. I, p. 107.) From nests made in captivity, I know that *Pachylomerus turris* and *Nidivalvata angustata* make different nests according as the environments change.

(To be continued.)

A monograph of the species of the subfamilies Eucneminae, Cerophytinae and Perothopinae inhabiting the United States. By George H. Horn, M.D. Tr. Am. Ent. Soc. xiii p. 58. February 1886.

The species in these groups are mostly rare, and are very generally wrongly named in collections. The present paper is therefore very timely since it not only calls attention to the insects, but enables students to straighten out their material. It would be interesting to discover something of the habits of these species. Most of them are accidental finds and no one knows exactly where to look for them with any certainty of success.